

Appn. No. 10/553,588
Amendment dated September 25, 2007
Examiner's phone conversation dated September 18, 2007

REMARKS/ARGUMENTS

This amendment has been filed to correct some formal matters in the specification, in response to the phone conversation with Examiner Arbes on September 18, 2007, pursuant to 37 CFR § 1.312.

The application has been carefully reviewed in light of the concerns of Examiner Arbes, and amended as necessary.

A courtesy copy of the amendment is being sent to the examiner via facsimile (1-571-273-4563) as requested.

If there are any additional fees resulting from this communication, please charge same to our Deposit Account No. 16-0820, our Order No. NGB-38837.

Respectfully submitted,
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Date: September 25, 2007

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AMENDMENT UNDER 37 CFR § 1.312(a)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant : Shigeki Imafuku et al.
Appln. No. : 10/553,588
Filed : October 17, 2005
Title : DEVICE AND METHOD FOR MOUNTING PART

Conf. No. : 1501
TC/A.U. : 3729
Examiner : C. J. Arbes

Customer No. : 000,116
Docket No. : 38837

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P.O. Box 1450
Alexandria, VA 22313-1450

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AMENDMENT "C"
FILED AFTER ALLOWANCE UNDER RULE 312

Sir:

This amendment is filed in response to the phone conversation with Examiner Arbes on September 18, 2007, pursuant to 37 CFR § 1.312.

Please amend the above-identified application in the following manner.

Amendments to the Specification begin on page 2 of this paper.

Remarks/Arguments begin on page 9 of this paper.

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AMENDMENTS TO THE SPECIFICATION

Please replace the paragraph on page 4, lines 1-19, with the following amended paragraph.

A component mounting apparatus according to Claim 1 the claims of the present invention is a component mounting apparatus including: a nozzle for holding a component at its lower end, the component being supplied from a component supply unit; a nozzle elevating means for moving the nozzle up/down; a nozzle moving means for moving the aforementioned nozzle horizontally; obstacles higher than a height with which the component is picked up from the aforementioned component supply unit or a height with which the component is to be mounted on a board conveyed by conveyance rails; and a control means for controlling the aforementioned nozzle elevating means and the aforementioned nozzle moving means so that the component moved by the aforementioned nozzle moving means is mounted on the aforementioned board. The component mounting apparatus is characterized in that: the aforementioned control means stores positions and heights of a plurality of the obstacles disposed between the aforementioned component supply unit and the aforementioned board; and when the aforementioned nozzle having picked up the component in a position to pick up the component from the aforementioned component supply unit is to move to a position to mount the component on the aforementioned board, the control means locates the aforementioned nozzle at a height high enough not to interfere with a first one of the obstacles and then moves the nozzle to a height high enough not to interfere with a next one of the obstacles in sync with the time when the nozzle has finished passing over the first obstacle.

Please replace the paragraph on page 4, lines 20-32 and carries over to page 5, line 1, with the following amended paragraph.

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A component mounting apparatus according to Claim 2 the claims is characterized in that: the obstacles include at least one of a component camera for photographing the component from below the aforementioned nozzle, one of the conveyance rails for conveying the aforementioned board, a nozzle station for storing spare nozzles, and a reference mark provided between the aforementioned component supply unit and the aforementioned board and for performing position correction; and after the component has been photographed by the aforementioned component camera, the aforementioned nozzle is moved down in sync with the time when the nozzle has finished passing over the component camera, the aforementioned nozzle is moved down in sync with the time when the aforementioned nozzle has finished passing over the conveyance rail, the aforementioned nozzle is moved down in sync with the time when the aforementioned nozzle has finished passing over the aforementioned nozzle station, or the aforementioned nozzle is moved down in sync with the time when the aforementioned nozzle has finished

Please replace the paragraph on page 5, lines 1-20, with the following amended paragraph:

A component mounting apparatus according to Claim 3 the claims is a component mounting apparatus including: a nozzle for holding a component at its lower end, the component being supplied from a component supply unit; a nozzle elevating means for moving the nozzle up/down; a nozzle moving means for moving the aforementioned nozzle horizontally; obstacles higher than a height with which the component is picked up from the aforementioned component supply unit or a height with which the component is to be mounted on a board conveyed by conveyance rails; and a control means for controlling the aforementioned nozzle elevating means and the aforementioned nozzle moving means so that the component moved by the

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aforementioned nozzle moving means is mounted on the aforementioned board. The component mounting apparatus is characterized in that: the aforementioned control means stores positions and heights of a plurality of the obstacles disposed between the aforementioned component supply unit and the aforementioned board; and when the aforementioned nozzle having picked up the component in a position to pick up the component from the aforementioned component supply unit is to move to a position to mount the component on the aforementioned board, the control means determines a horizontal path to allow the nozzle to move to a component mounting position on the board while keeping a predetermined height, and moves the nozzle in the horizontal path. Thus, the nozzle can move with the height of the nozzle at a required minimum height.

Please replace the paragraph that starts on page 5, line 21 and carries over to page 6 lines 1 - 7 with the following paragraph.

A component mounting apparatus according to Claim 4 the claims is a component mounting apparatus including: a nozzle for holding a component at its lower end so as to mount the component on a board, the component being supplied from a component supply unit; a nozzle elevating means for moving the nozzle up/down; a nozzle moving means for moving the aforementioned nozzle horizontally; and a control means for controlling the aforementioned nozzle elevating means and the aforementioned nozzle moving means so that the component moved by the aforementioned nozzle moving means is mounted on the aforementioned board. The component mounting apparatus is characterized in that: the aforementioned control means controls the aforementioned nozzle elevating means so that the aforementioned nozzle approaches a component mounting region movement height close to the aforementioned board when the nozzle has arrived in a component mounting region above the aforementioned board; and the aforementioned control means controls the aforementioned nozzle moving means so that the nozzle holding the aforementioned component at the aforementioned component mounting region movement height is moved to a component mounting position on the aforementioned board so as to mount the aforementioned component from the aforementioned component mounting region movement height to the aforementioned component mounting position. Thus, it

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is possible to shorten an elevating stroke of the nozzle at the time of mounting the component so that it is possible to improve the production efficiency.

Please replace the paragraph on page ~~5~~⁶, lines 8-11, with the following amended paragraph.

A component mounting apparatus according to ~~Claim 5~~^{the} claims is characterized in that board marks provided on end portion sides of the aforementioned board are recognized, and the aforementioned component mounting region is calculated based on the recognized board marks.

Please replace the paragraph on page ~~5~~⁶, lines 12-17, with the following amended paragraph.

A component mounting apparatus according to ~~Claim 6~~^{the} claims further includes: a conveyance rail movable in accordance with a width of the board to be conveyed; and a position detection means for detecting a position of the conveyance rail. The component mounting apparatus is characterized in that the aforementioned component mounting region is calculated from information of the position of the conveyance rail detected by the position detection means.

Please replace the paragraph on page ~~5~~⁶, lines 18-21, with the following amended paragraph.

A component mounting apparatus according to ~~Claim 7~~^{the} claims is characterized in that the aforementioned component mounting region movement height is a height defined in consideration of a height of each component mounted on the board, a height of the component held by the nozzle, and a gap necessary for the nozzle to move.

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Please replace the paragraph on page 5, lines 22-29, with the following amended paragraph.

A component mounting apparatus according to ~~Claim 8~~the claims is characterized in that when the aforementioned component is to be mounted from the aforementioned component mounting region movement height to the component mounting position of the aforementioned board, the aforementioned control means drives the aforementioned nozzle elevating means and the aforementioned nozzle moving means simultaneously so as to move the aforementioned nozzle in an arc moving trajectory. Thus, it is possible to shorten time for moving the nozzle at the time of mounting the component so that it is possible to improve the production efficiency.

Please replace the paragraph that starts on page 6, line 30 and carries over to page 7, lines 1-15, with the following amended paragraph.

A component mounting method according to ~~Claim 9~~the claims is a component mounting method including the steps of: using a nozzle to hold a component at its lower end, the component being supplied from a component supply unit; moving the nozzle up/down and horizontally while avoiding obstacles higher than a height with which the component is picked up from the aforementioned component supply unit or a height with which the component is to be mounted on a board conveyed by conveyance rails; and mounting the aforementioned component on the board. The component mounting method is characterized in that: positions and heights of a plurality of the obstacles disposed between the aforementioned component supply unit and the aforementioned board are stored; and when the aforementioned nozzle is to move from a position to pick up the component from the aforementioned component supply unit to a position to mount the picked-up component on the aforementioned board, a highest one is found from the aforementioned plurality of obstacles, the aforementioned nozzle is moved up to a height high enough not to interfere with the aforementioned highest obstacle, the nozzle is moved horizontally, a current height of the nozzle is compared with a height of an obstacle the nozzle will pass over as soon as the nozzle has finished passing over the aforementioned highest

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obstacle, and the nozzle is moved down to a height high enough not to interfere with the aforementioned obstacle the nozzle will pass over when the nozzle is higher than the height of the obstacle.

Please replace the paragraph on page 7, lines 16-29, with the following amended paragraph.

A component mounting method according to ~~Claim 10~~the claims is a component mounting method including the steps of: using a nozzle to hold a component at its lower end, the component being supplied from a component supply unit; moving the nozzle up/down and horizontally; and mounting the aforementioned component on the board. The component mounting method is characterized in that: the aforementioned nozzle is made to approach a component mounting region movement height close to the aforementioned board when the nozzle has arrived in a component mounting region above the aforementioned board; the aforementioned nozzle holding the aforementioned component at the aforementioned component mounting region movement height is moved to a component mounting position on the aforementioned board; and the aforementioned component is mounted from the aforementioned component mounting region movement height to the aforementioned component mounting position. Thus, it is possible to shorten an elevating stroke of the nozzle at the time of mounting the component so that it is possible to improve the production efficiency.

Please replace the paragraph that starts on page 7, line 30 and carries over to page 8, lines 1-3, with the following amended paragraph.

A component mounting method according to ~~Claim 11~~the claims is characterized that a horizontal movement operation and an elevating operation are performed simultaneously so as to move the aforementioned nozzle in an arc moving trajectory when the aforementioned component is to be mounted on the aforementioned board. Thus, it is possible to shorten time

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for moving the nozzle at the time of mounting the component so that it is possible to improve the production efficiency.

Please replace the paragraph on page 8, lines 4-9, with the following amended paragraph.

According to ~~Claims 1, 2 and 8~~the claims, it is possible to move down the nozzle in accordance with the height and position of each obstacle while overlapping with the obstacle when the nozzle is to be moved from the component supply portion to the board. Accordingly, when the nozzle has arrived at the mounting point above the board, the height of the nozzle can be set at a required minimum value so that the elevating stroke of the nozzle at the time of mounting the component becomes shortest.

Please replace the paragraph on page 12, lines 10-14, with the following amended paragraph.

The obstacle list may be registered into the computer by a person, or may be registered based on automatic measurement of the board camera etc. When only the conveyance rail, the nozzle station, the component camera or the referenced mark is registered in this obstacle list, requirements of ~~Claim 2, 3, 4 or 5~~the claims can be satisfied.

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